

Amendments to the Drawings:

The attached Replacement Sheets (1/16, 2/16, 12/16, 13/16, 14/16, 15/16 and 16/16) of the drawings includes Figs. 1, 2A, 2B, 2C. 3. 14. 15. 16. 17 and 18. These Replacement Sheets replace the original sheets.

Applicants have amended Figs. 1, 2A, 2B, 2C. 3. 14. 15. 16. 17 and 18 to add the legend "Prior Art".

Attachments: Replacement Sheets 1/16, 2/16, 12/16, 13/16, 14/16, 15/16 and 16/16.

REMARKS

After the foregoing Amendment claims 1-19, as amended, are pending in this application. Claims 1, 9, 14 and 17-19 were amended in order to more particularly point out and distinctly claim what the Applicants regard as the invention. Claim 6 was amended in order to make this claim more definite. Claims 20-22 have been cancelled. No new matter has been added as a result of the foregoing Amendment.

Drawings

Figs. 1-3 and 14-18 were objected to because these figures did not include the legend "Prior Art". By the foregoing drawing amendment Figs. 1-3 and 14-18 have been revised to add the legend "Prior Art" to each figure. Enclosed herewith are replacement sheets 1/16, 2/16, 12/16, 13/16, 14/16, 15/16 and 16/16 which incorporate the revised figures. In view of the drawing amendment and the submission of the replacement sheets it is respectfully submitted that the drawing objections should be withdrawn.

Specification

The title was objected to as not being descriptive. By the foregoing Amendment the title has been changed in the manner suggested by the Examiner. Accordingly, it is respectfully submitted that the objection to the title should be withdrawn.

Formal Claim Rejection

Claim 6 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. By the foregoing Amendment, claim 6 has been changed to provide proper antecedent basis for the claim limitations objected to by the Examiner. Accordingly, it is respectfully submitted that the rejection of claim 6 under 35 U.S.C. § 112, should be withdrawn.

Claim Rejection – Non-Statutory Subject Matter

Claims 20-22 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. By the foregoing Amendment claims 20-22 were cancelled. Accordingly, this rejection is deemed to be moot.

Prior Art Rejections

Claims 1-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,061,318 (Hwang) in view of the Applicants Admitted Prior Art (APA). It was the position of the Examiner that the Hwang patent discloses an optical disc drive for reading and/or writing information from/on multiple types of optical discs having information storage layers with mutually different depths as measured from the surface. The Examiner states that the Hwang disc drive includes a light source for emitting light, a lens for converging the light to form a beam spot, a photodetector for detecting light reflected from an information storage layer of a disc and outputting a reflected light signal, a focus driver for moving the beam spot perpendicularly to the information storage layer of the disc, a light quantity detector for generating a light quantity signal representing the quantity of light reflected and a type recognizer for recognizing a type of the loaded optical disc by estimating a depth of the information storage layer from the surface. The Examiner further takes the position that the APA admits that a spherical aberration generator for generating a minimum spherical aberration when the beam spot is located at a reference depth is well known in the art and that it would have been obvious to one of ordinary skill in the art to combine the optical disc recognition system disclosed by the Hwang patent with the spherical aberration generator of the APA. For the reasons as set forth in detail below the Applicants respectfully traverse the rejection of claims 1-19.

The present invention is directed to an optical disc drive for reading and/or writing information from/on multiple types of optical discs of which information storage layers have mutually different depths as measured from surfaces thereof. Referring to Fig. 4 and claim 1, in the first embodiment, the present invention comprises a light source (11) which emits a laser beam of a predetermined wavelength, a lens (13) for converging the light to form a beam spot on the disc and a photodetector (15) for detecting light that has been reflected from an information storage layer of the disc (1) and outputting reflected light signals. A spherical aberration generator (16) is provided for generating a minimum spherical aberration when the beam spot is located at a reference depth that is defined by the depths of the information storage layers of the optical disc. A focus driver is provided for moving the beam spot perpendicularly to the information storage layer of the optical disc by controlling the position of the lens. The focus

driver is comprised of a focus drive signal generator (22) and a focus actuator (14) which actually controls the position of the lens. The present invention further comprises a light quantity detector (40) for generating a light quantity signal representative of the quantity of reflected light upon receiving and obtaining the sum of the reflected light signals from the photodetector every time the beam spot is moved. As described in the specification the Applicants have determined that there is a close correlation between the depth of the beam spot in the optical disc (specifically the magnitude of the spherical aberration generated) and the light quantity signals output from the reflected light quantity detector (40). A detailed discussion of these relationships is set forth beginning at paragraph [0087] of the present specification. The present invention as defined by amended claim 1 further includes a type recognizer (42) which recognizes the type of the optical disc by estimating the depth of the information storage layer according to a degree of symmetry of a wave form of the light quantity signal.

The Hwang patent utilizes a focus error (FE) signal as the basis for conducting all of its adjustment operations. The FE signal represents a positional relationship between the focus of the light beam and the optical disc. It is respectfully submitted that the FE signal as used in the Hwang patent is not the same as and cannot be substituted for the light quantity signal obtained by the sum of the reflected light signals as called for in each of the amended claims of the present application. The light quantity signal obtained by summing the reflected light signals in the present invention and the FE signal of the Hwang patent are very different characteristics as illustrated in Figs. 8 and 9 of the present application. Fig. 8 shows wave forms of signals in a situation where the depth of the target information storage layer is deeper than a reference depth at which the best spherical aberration can be obtained. Fig. 9 shows wave forms of signals in a situation where the depth of the target information storage layer is shallower than the reference depth at which the best spherical aberration can be obtained. Figs. 8(a) and 9(a) demonstrate that the wave forms of the FE signals are substantially the same whether the depth of the target information storage layer is deeper than the reference depth or shallower than the reference depth. However, as demonstrated by Figs. 8(b) and 9(b) the wave forms of the light quantity signals (the sum of the reflected light signals) are quite different depending upon whether the target information storage layer is deeper than the reference depth or shallower than the reference depth. Figs. 8 and 9 clearly demonstrate that the FE signals used in the device of the Hwang patent are not, in any way, the same as or even equivalent to the use of the light quantity signal

obtained by the summing of the reflected light signals of the present invention as now set forth in each of the independent claims. Not only does the Hwang patent not disclose the use of a light quantity signal obtained from the sum of the reflected light signals but the use of such a light quantity signal is not even remotely suggested in the Hwang patent. Further, it is respectfully submitted that the Hwang patent teaches away from the use of such a light quantity signal (sum of the reflected light signals) since it utilizes only the FE signal for all of its adjustments. For example, the number of reflection layers in an optical disc is specified by a number "n" of detection of the FE signal of the reflection characteristic curve (see col. 6, line 63 through col. 7, line 18 of the Hwang patent). In addition, a type of the optical disc is also specified by the elapsed time that the reflection characteristic curve is detected (see col. 7, lines 8-55 of the Hwang patent).

Independent claims 1, 9, 14, 17, 18 and 19 have all been amended to make it clear that the light quantity signal is obtained by receiving and obtaining the sum of the reflected light signals from the photodetector every time the beam spot is moved. As discussed in detail above, the Hwang patent does not disclose, teach or even remotely suggest the use of such a light quantity signal. It is therefore respectfully submitted that independent claims 1, 9, 14, 17, 18 and 20 as well as all claims dependent therefrom distinguish patentably over the Hwang patent. It is therefore respectfully submitted that the rejection of claims 1-19 under 35 U.S.C. § 103(a) should be withdrawn.

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CONCLUSION

In view of the foregoing amendments to the title, claims and drawings and in view of the foregoing discussion it is respectfully submitted that the present application, including claims 1-19, as amended, is in condition for allowance and such action is respectfully solicited.

Respectfully submitted,

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(Date)

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